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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/741,824	12/19/2003	Ling Chen	007532	2621
44257	7590	10/03/2006	EXAMINER	
PATTERSON & SHERIDAN, LLP 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056			PARKER, JOHN M	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 10/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/741,824	CHEN ET AL.
	Examiner	Art Unit
	John M. Parker	2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 20 July 2006.
 2a) This action is **FINAL**. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1,3-12,14-19 and 21-26 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1,3-12,14-19 and 21-26 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 07 January 2005 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) <input type="checkbox"/> Notice of Informal Patent Application
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____	6) <input type="checkbox"/> Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,3-12, and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. (US Pat. #6734559) in view of Gates et al (US Pat. #6203613).

Regarding claim 1, Yang teaches a method for forming a cap layer, comprising: depositing a barrier layer in a feature in a dielectric layer of a substrate[fig. 3, 221 and 226 respectively];

filling the feature with a metal-containing layer [fig. 3, 201]; planarizing the substrate [column 4, lines 25-28]; and depositing a refractory metal nitride cap layer on the substrate [fig. 4, 206].

Yang fails to disclose that the cap layer is deposited by a cyclical deposition process comprising alternately pulsing a metal-containing compound and a nitrogen-containing compound to deposit the refractory metal nitride cap layer. However Gates teaches the deposition of a metal nitride layer by atomic layer deposition which cyclically pulses metal containing compound and a nitrogen containing compound [column 10, lines 25-52]

It would have been obvious to one of ordinary skill in the art to combine the teachings of Yang and Gates to enable the method of depositing a refractory metal nitride cap layer to be performed according to the teachings of Gates. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative, suitable or useful methods of performing the disclosed process step of metal nitride layer deposition. Art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Regarding claim 3, Yang in view of Gates discloses the method of claim 1, wherein the refractory metal nitride layer comprises tantalum nitride [Yang, column 4, line 40 as well as Gates, column 10, line 51].

Regarding claim 4, Yang in view of Gates teaches the method of claim 1, wherein the pulsing is continued until the refractory metal nitride layer has a crystalline like structure over the metal-containing layer [Gates, column 7, lines 27-30 teaches that any desired thickness can be achieved repeating the deposition cycle, furthermore regarding the limitation that the layer is crystalline, this is an obvious outcome by depositing the layer by the same processes with the same parameters as the instant application].

Regarding claim 5, Yang in view of Gates teaches the method of claim 1, wherein the pulsing occurs at a pressure between about 0.5 Torr and about 5 Torr at a temperature between about 150.degree. C. and about 350.degree. C. [Gates, column 10, line 39 discloses a temperature in the range claimed]

Furthermore regarding the claimed pressure range one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 6, Yang in view of Gates discloses the method of claim 1, wherein the pulsing is repeated until the cap layer has a thickness of about 10 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness of about 10 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process would possess utility

using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 7, Yang in view of Gates teaches the method of claim 1, wherein the pulsing is repeated until the cap layer has a thickness of from about 5 angstroms to about 20 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness from about 5 angstroms to about 20 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re*

Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 8, Yang in view of Gates discloses the method of claim 1, further comprising flowing a non-reactive gas continuously during the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound [Gates, column 7, lines 10-20 teach a non-reactive gas purge between reactant pulses but fails to disclose it as continuous. However, because this gas is inert it does not affect or change how the reactant gas deposits material on the surface. It has been held that "[v]arying the details of a process, as by adding a step or splitting one step into two does not avoid infringement, where the processes are substantially identical or equivalent in terms of function, manner, and result. *Universal Oil Products Co. v. Globe Oil and Refining Co.*, 322 U.S. 471, 61 USPQ 382 (1944); *Ace Patents Corporation v. Exhibit Supply Co.*, 119 F.2d 349, 48 USPQ 667 (7th Cir. 1941); *King-Seeley Thermos Co. v. Refrigerated Dispensers Inc.*, 354 F.2d 533, 148 USPQ 114 (10th Cir. 1965). Identity of the apparatus used for executing the processes is not material in itself. *National Lead Company v. Western Lead Products Co.*, 324 F.2d 539, 139 USPQ 324 (9th Cir. 1963)." Excerpt from *Matherson-Selig Co. v. Carl Gorr Color Card, Inc.*, 154 USPQ 265 (DC NIII 1967)].

Regarding claim 9, Yang in view of Gates teaches the method of claim 1, wherein the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound are separated by a time delay [Gates, column 10, lines 40-45].

Regarding claim 10, Yang in view of Gates discloses the method of claim 1, wherein the refractory metal nitride cap layer has a thickness sufficient to block diffusion of metal atoms from the metal-containing layer [Yang, column 5, lines 61-67]

Regarding claim 11, Yang in view of Gates teaches the method of claim 1, further comprising depositing an etch stop layer on the refractory metal nitride cap layer [Yang, column 6, lines 6-9].

Regarding claim 12, Yang in view of Gates discloses a method for processing a substrate, comprising:

depositing a barrier layer in a feature in a dielectric layer of a substrate [Yang, fig. 3, 221 and 226 respectively];
filling the feature with a metal-containing layer [Yang, fig. 3, 201];
planarizing the substrate [Yang, column 4, lines 25-28];
depositing a cap layer comprising tantalum nitride on the substrate [Yang, column 4, lines 35-43] by a cyclical deposition process comprising alternately pulsing a tantalum-containing compound and a nitrogen-containing compound to deposit the cap layer [Gates, column 5, lines 25-52, while a tantalum containing compound is not specifically disclosed, it would be obvious to one of ordinary skill in the art that a tantalum compound is used to obtain the disclosed TaN layer]; and
depositing an etch stop layer on the cap layer [Yang, column 6, lines 6-9].

Regarding claim 14, Yang in view of Gates teaches the method of claim 12, wherein the pulsing is continued until the refractory metal nitride layer has a crystalline like structure over the metal-containing layer [Gates, column 7, lines 27-30 teaches that any desired thickness can be achieved repeating the deposition cycle, furthermore regarding the limitation that the layer is crystalline, this is an obvious outcome by depositing the layer by the same processes with the same parameters as the instant application].

Regarding claim 15, Yang in view of Gates teaches the method of claim 12, wherein the pulsing is repeated until the cap layer has a thickness of from about 5 angstroms to about 20 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness from about 5 angstroms to about 20 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*,

725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 16, Yang in view of Gates discloses the method of claim 12, further comprising flowing a non-reactive gas continuously during the pulsing of the tantalum-containing compound and the pulsing of the nitrogen-containing compound [Gates, column 7, lines 10-20 teach a non-reactive gas purge between reactant pulses but fails to disclose it as continuous. However, because this gas is inert it does not affect or change how the reactant gas deposits material on the surface. It has been held that "[v]arying the details of a process, as by adding a step or splitting one step into two does not avoid infringement, where the processes are substantially identical or equivalent in terms of function, manner, and result. *Universal Oil Products Co. v. Globe Oil and Refining Co.*, 322 U.S. 471, 61 USPQ 382 (1944); *Ace Patents Corporation v. Exhibit Supply Co.*, 119 F.2d 349, 48 USPQ 667 (7th Cir. 1941); *King-Seeley Thermos Co. v. Refrigerated Dispensers Inc.*, 354 F.2d 533, 148 USPQ 114 (10th Cir. 1965). Identity of the apparatus used for executing the processes is not material in itself. *National Lead Company v. Western Lead Products Co.*, 324 F.2d 539, 139 USPQ 324 (9th Cir. 1963)." Excerpt from *Matherson-Selig Co. v. Carl Gorr Color Card, Inc.*, 154 USPQ 265 (DC NIII 1967)].

Regarding claim 17, Yang in view of Gates teaches the method of claim 12, wherein the pulsing of the tantalum-containing compound and the pulsing of the

nitrogen-containing compound are separated by a time delay [Gates, column 10, lines 40-45].

Regarding claim 18, Yang in view of Gates discloses the method of claim 12, wherein the refractory metal nitride cap layer has a thickness sufficient to block diffusion of metal atoms from the metal-containing layer [Yang, column 5, lines 61-67].

Claims 19, and 20-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang in view of Gates as applied to claims 1,3-11, and 13-18 above, and further in view of Naik et al. (US Pat. #6204168).

Regarding claim 19, Yang in view of Gates teaches a method of forming a dual damascene structure, comprising:

Depositing a first dielectric film on a substrate [Yang, fig. 3, 212];

Depositing an etch stop on the first dielectric film [Yang, fig. 3, 214];

Depositing a second dielectric film on the etch stop and the exposed first dielectric film [Yang, fig. 3, 226];

Etching the second dielectric film to define a horizontal interconnect and a vertical interconnect [Yang, fig. 3, 201 and 210 are where the films were etched];

Depositing a barrier layer on the substrate [Yang, fig. 3, 221];

Depositing a metal-containing layer on the substrate to fill the vertical interconnect and the horizontal interconnect [Yang, fig. 3, 201,210];

Planarizing the metal-containing layer and the second dielectric film [Yang, column 4, lines 25-28];

Depositing a refractory metal nitride cap layer on the planarized metal-containing layer and the planarized second dielectric film by a cyclical deposition process [Yang, fig. 3, 206] comprising alternately pulsing a metal-containing compound and a nitrogen-containing compound to deposit the refractory metal nitride cap layer [Gates, column 5, lines 25-52]; and

Depositing an etch stop layer on the refractory metal nitride cap layer [Yang, column 6, lines 7-9].

Yang in view of Gates fails to state the specific method in which the dual damascene trenches are formed. However, Naik teaches a method of forming a dual damascene structure including depositing a first dielectric film [fig. 1b, 102], depositing an etch stop on the first dielectric film [fig. 1c, 104], pattern etching the etch stop to define a vertical interconnect opening and expose the first dielectric film [fig. 1d, 106], depositing a second dielectric film on the etch stop and exposed dielectric film [fig. 1e, 108], pattern etching the second dielectric film to define a horizontal interconnect and continuing to etch the exposed first dielectric film to define the vertical interconnect [fig. 1h, 114 and 106].

It would have been obvious to one of ordinary skill in the art to combine the teachings of Yang in view of Gates and Naik to enable the method of dual damascene opening formation to be performed according to the teachings of Naik. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative, suitable or useful methods of performing the disclosed process steps of damascene

opening formation. Art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Regarding claim 21, Yang in view of Gates further in view of Naik discloses the method of claim 19, wherein the refractory metal nitride layer comprises tantalum nitride [Yang, column 4, lines 38-41 as well as Gates, column 10, line 51].

Regarding claim 22, Yang in view of Gates further in view of Naik teaches the method of claim 19, wherein the pulsing is continued until the refractory metal nitride layer has a crystalline like structure over the metal-containing layer [Gates, column 7, lines 27-30 teaches that any desired thickness can be achieved repeating the deposition cycle, furthermore regarding the limitation that the layer is crystalline, this is an obvious outcome by depositing the layer by the same processes with the same parameters as the instant application].

Regarding claim 23, Yang in view of Gates further in view of Naik discloses the method of claim 19, wherein the pulsing is repeated until the cap layer has a thickness of from about 5 angstroms to about 20 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness from about 5 angstroms to about 20 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process

would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 24, Yang in view of Gates further in view of Naik teaches the method of claim 19, further comprising flowing a non-reactive gas continuously during the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound [Gates, column 7, lines 10-20 teach a non-reactive gas purge between reactant pulses but fails to disclose it as continuous. However, because this gas is inert it does not affect or change how the reactant gas deposits material on the surface. It has been held that "[v]arying the details of a process, as by adding a step or splitting one step into two does not avoid infringement, where the processes are substantially identical or equivalent in terms of function, manner, and result. *Universal Oil Products Co. v. Globe Oil and Refining Co.*, 322 U.S. 471, 61 USPQ 382 (1944); *Ace Patents Corporation v. Exhibit Supply Co.*, 119 F.2d 349, 48 USPQ 667 (7th Cir. 1941); *King-Seeley Thermos Co. v. Refrigerated Dispensers Inc.*, 354 F.2d 533, 148 USPQ 114 (10th Cir. 1965). Identity of the apparatus used for executing the processes is not material in itself. *National Lead Company v. Western Lead Products Co.*, 324 F.2d 539,

139 USPQ 324 (9th Cir. 1963)." Excerpt from *Matherson-Selig Co. v. Carl Gorr Color Card, Inc.*, 154 USPQ 265 (DC NIII 1967)].

Regarding claim 25, Yang in view of Gates further in view of Naik discloses the method of claim 19, wherein the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound are separated by a time delay [Gates, column 10, lines 40-45].

Regarding claim 26, Yang in view of Gates further in view of Naik teaches the method of claim 19, wherein the refractory metal nitride cap layer has a thickness sufficient to block diffusion of metal atoms from the metal-containing layer [Yang, column 5, lines 61-67].

Response to Arguments

Applicant's arguments with respect to claims 1 and 12 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed 20 July 2006 in regards to claim 19 have been fully considered but they are not persuasive. Applicant argues that Yang does not teach depositing a cap layer onto a planarized metal-containing layer. However this is not persuasive as Yang clearly states the metal containing layer is planarized by chemical mechanical polish prior to an etching and cap layer formation, therefore even though the metal-containing layer is not co-planar with the second dielectric layer it is considered a planarized layer when the cap layer is deposited.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Parker whose telephone number is 571-272-8794. The examiner can normally be reached on Monday - Friday 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



John M. Parker



George Fourson
Primary Examiner